Power-system protection - course description

General information

Course name	Power-system protection
Course ID	06.2-WE-ELEKTP-P-SP-Er
Faculty	Faculty of Computer Science, Electrical Engineering and Automatics
Field of study	Electrical Engineering
Education profile	academic
Level of studies	First-cycle Erasmus programme
Beginning semester	winter term 2021/2022

Course information

Semester	6
ECTS credits to win	5
Course type	optional
Teaching language	english
Author of syllabus	• dr hab. inż. Adam Kempski, prof. UZ

Classes forms

The class form	Hours per semester (full-time)	Hours per week (full-time)	Hours per semester (part-time)	Hours per week (part-time)	Form of assignment
Lecture	30	2	-	-	Exam
Laboratory	30	2	-	-	Credit with grade
Project	15	1	-	-	Credit with grade

Aim of the course

- to acquaint students with the principles of functioning of power system protection;

- to familiarize students with the main protection criteria and their implementation;

- creations of basic skills in power system protection settings.

Prerequisites

Fundamentals of electrical engineering, Fundamentals of electrical power engineering , High-voltage engineering, Digital signal processing.

Scope

Power system faults. Electrical power system faults classification. Faults within the scope of power protection system

Role and functions of protection system in electrical power system. General structure. Functional scheme. Basic requirements. Reliability and redundancy.

Data collecting and processing. Current and voltage signals in fault states. Measurement circuits in relay protection system. Converters of measuring quantities in protection system.

Signal processing in relays and relay protection system. Single- and multi-input relays. Phase and amplitude comparators. Two-state input circuits. Digital techniques in measurement and data processing protection structures.

Basic power system protection criteria and circuit realization. Overcurrent criterion. Instantaneous and delayed over-current protection. Over- and undervoltage criteria. Differential current protection. Impedance criterion. Distance protection. Power direction. Directional overcurrent protection. Decision-making methods and algorithms.

Relay protection of basic power system units. Principles of a selection and arrangements of the protection for basic units of electrical power system (distribution and transmission lines, generators, transformers, motors)

Restoring and preventing automatics. Automatic reclosing. Automatic reserve switching (ARS). Automatic under-frequency load shedding (UFLS).

Teaching methods

Lecture: conventional lecture
Laboratory: laboratory exercises, group work
Project: project method, discussions and presentations

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
Knows and understands the basic operating criteria and implementation principles of simple power system protection assemblies.		• an exam - oral, descriptive, test and other	• Lecture

Outcome description	Outcome symbols	Methods of verification	The class form
Knows and understands phenomena and threats in the power system during disturbances		• an exam - oral, descriptive, test and other	• Lecture
Can choose the layout and settings in simple power protection system assemblies		• an ongoing monitoring during classes	• Laboratory • Project

Assignment conditions

Lecture – obtaining a positive grade in written or oral exam.
Laboratory – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester.
Project – the main condition to get a pass are sufficient marks for all exercises and tests conducted during the semester

Calculation of the final grade: lecture 50% + laboratory 30% + project 20%

Recommended reading

1. Ungrad H., Winkler W. Wiszniewski: *Protection Techniques in Electrical energy Systems*. Marcel Dekker Inc. 1995.
2. Blackburn J. L.: *Protective Relaying. Principles and Applications*, Marcel Dekker, 1998
3. Anderson P.M.: *Power System Protection*, McGraw-Hill, 1999.
4. Winkler W., Wiszniewski A., Automatyka zabezpieczeniowa w systemach elektroenergetycznych, WNT, Warszawa, 2004.(in Polish)

Further reading

1. Januszewski M., Kowalik R., Smolarczyk A.: Cyfrowa elektroenergetyczna automatyka zabezpieczeniowa, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2006.
2. Żydanowicz J., Namiotkiewicz M.: Automatyka zabezpieczeniowa w elektroenergetyce, WNT, W-wa, 1983.
3. Wiszniewski A.: Algorytmy pomiarów cyfrowych w automatyce elektroenergetycznej, WNT, W-wa, 1990.

Notes

Modified by dr hab. inż. Paweł Szcześniak, prof. UZ (last modification: 08-07-2021 21:49)

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